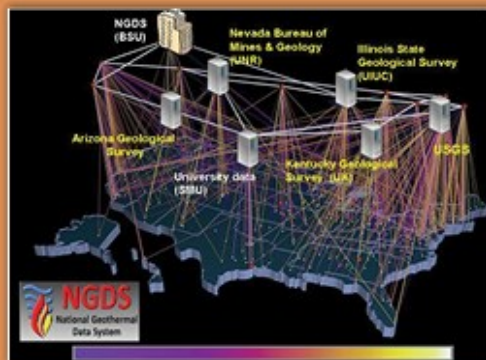


Arizona Geological Survey Briefing Book

Mapping
Natural Resources
Natural Hazards
Environment
Geoinformatics
Outreach



Overview

The Arizona Geological Survey (AZGS) is one of the most innovative, entrepreneurial, and highly-regarded Surveys in the nation, with a growing portfolio of national and international programs and influence.

AZGS scientists are internationally recognized leaders in cyberinfrastructure and data management in areas ranging from geosciences, to global change research, to natural resources and natural hazards, to earth observation (satellite) data. AZGS' cyber developments have been adopted by the U.S. Department of Energy, the White House, U.S. GEO (Group on Earth Observation) Committee, Power Africa, and ISPRA (Geological Survey of Italy).

This briefing book provides a concise set of background information on the AZGS, including its diverse portfolio of professional staff, projects and services, and its funding model.

AZGS Quick Facts

- 27 AZGS employees in Tucson and Phoenix
- 8 Ph.D. scientists
- Expertise in geosciences, mineral resources, environmental science, information technology, data science, GIS, outreach and engagement at the local, state, national, international, and global level.
- AZGS has provided paid and unpaid internships, summer employment, and graduate student support to more than 60 students from more than 8 academic departments.
- Since 2011, AZGS entrepreneurial scientists have leveraged \$5,364,100 in state appropriations to attract more than \$35,807,848 in external research grants and contracts from federal, local, and private sponsors. AZGS has provided the State of Arizona with a \$6.68-to-\$1 direct return on its investment.

AZGS – University of Arizona Linkages

- Official university affiliate through Geosciences
- 3 Adjunct Professors - Geosciences
- Part of the University from 1893 to 1988
- \$3.6 million NSF EarthCube grant is through UA Geosciences
- Collaborations with Geosciences, Mining & Geological Engineering, Hydrology & Water Resources, Institute of the Environment, iPlant, School of Information, Civil Engineering, Management Information Systems (Eller), and others

AZGS Notable Accomplishments 2010-2015

Arizona

- Successfully transitioned from a state-funded agency to mostly grant-funded, and tripled in size
- Completed first statewide mapping of earth fissures; online interactive map used hundreds of thousands of time by realtors, developers, planners, and home-buyers
- Engaged 116,000 Arizonans—including more than 80,000 K-12 students—in the Great Arizona Shakeout earthquake preparedness drill
- More than 1,000 AZGS publications placed in an online document repository for free downloading, which encompasses almost all AZGS documents dating from 1915 to present

- Development of the “Arizona Experience” interactive multimedia website (www.arizonaexperience.com) for the Arizona Centennial, along with retail and online store promoting Arizona products
- AZGS report on potash in the Holbrook basin precipitated \$60 million in industry exploration programs and plans to develop two underground mines at \$1-1.5 billion each
- Merged the AZ Dept. of Mines & Mineral Resources into the Survey and digitized ~360,000 pages of historical mining reports, 10,000 maps, and thousands of historical photos, for free online distribution (www.minedata.azgs.az.gov)
- Ability to detect all magnitude 3.0 earthquakes in Arizona for the first time, using the AZGS-managed Arizona Broadband Seismic Network
- Discovery and initial characterization of the Chino Valley fault zone
- Completed three studies characterizing the potential for geological carbon sequestration for most of the state
- Post-fire hazards assessment for floods and debris flows after multiple wildfires
- Assistance to Havasupai Tribe following catastrophic flooding
- AZGS is a pioneer in use of social media by government
 - *Arizona Geology* blog since 2007: >4,200 posts, 2 million views; one of first science blogs included in Library of Congress archives
 - Twitter: in the top 1% for followers
 - Facebook followers: 15,000–85,000 per week

National

- Successful deployment of the \$22 million National Geothermal Data System (NGDS) project, with >1,000 data sets representing over 10 million data points posted from over 65+ data providers in all 50 states, meeting all requirements of the White House Open Data Access initiative (www.geothermaldata.org)
- Public launch of the AZGS-led National Geothermal Data System at the White House Energy Datapalooza by U.S. Secretary of Energy Ernest Moniz
- Lead the National Science Foundation-funded EarthCube test enterprise governance initiative to develop geoscience cyberinfrastructure management (www.earthcube.org)
- White House-managed US GEO Committee adopted USGIN schema (<http://usgin.org>) for Common Data Framework for \$30 billion of earth observation data collected annually
- Chosen by the West Big Data Hub to organize the Hazards and Resources Spoke to demonstrate societal benefits of NSF investment in supercomputing and big data initiatives
- AZGS geologists were awarded the John C., Frye Award from the Geological Society of America for the outstanding environmental publication three times, more than any other organization in the country
- Determination that breccia pipe uranium resources in northern Arizona are at least 10 times greater than previously known



“One of the most successful programs to date is the National Geothermal Data System...”

*EARTH magazine,
September 2013*

International

- Co-chaired international secretariat and steering committee to produce recommendations adopted by 23-nation Belmont Forum for e-infrastructure and data management to support global change research

- USAID funded program tasks AZGS with assessing data management needs and capacities in East Africa for geothermal energy development; authorizes implementation starting in Kenya and Ethiopia
- NSF issues sole invitation to tender to AZGS to set up and run international Belmont Forum e-Infrastructure Coordination Office. European Commission, Japan Science & Technology Agency, and Taiwan Ministry of Science & Technology offer support.
- Adoption of the National Geothermal Data System by ISPRA, the Geological Survey of Italy

Budget Overview

Table 1, below, provides high-level views of AZGS' budget, including a historical perspective for the past several years. As illustrated below, the Survey has a strong track record of pulling in significant federal funding, along with additional non-appropriated state funds.

The 2016 budget overview is presented in Table 2, below.

Table 1. Five-year revenue overview

	FY2012	FY2013	FY2014	FY2015	FY2016
Revenue					
State appropriation	\$ 876,200	\$ 871,200	\$ 941,400	\$ 941,700	\$ 941,000
External Grants & Contracts	\$ 7,013,900	\$ 8,803,900	\$ 7,027,900	\$ 3,801,100	\$ 3,544,500
Total	\$ 7,890,100	\$9,675,100	\$ 7,969,300	\$ 4,742,500	\$ 4,485,500

[Note: FY16 grant revenues are through December 2015. We anticipate new awards of \$1.6-2 million in the next month.]

Table 2. FY2016 budget overview

Revenue	
State appropriation	\$ 941,000
Grants & contracts	\$ 3,499,500
Sales	\$98,113
Total	\$4,538,613
Expenditures	
Personnel	\$2,535,741
Professional Outside Services	\$ 636,400
In-State Travel	\$ 60,100
Out of State Travel	\$ 64,800
Aid to Organizations	\$ 713,300
Other Operating Expenses	\$ 485,672
Non-Capital Equipment	\$ 42,600
Total	\$4,538,613

AZGS's indirect cost agreement is currently through the U.S. Dept. of Energy with a new negotiated rate of 42.79%. AZGS retains 100% of the federal indirect costs and uses those funds for agency salaries, operations, and support.

Programs & Activities

Economic Geology - Key Duties

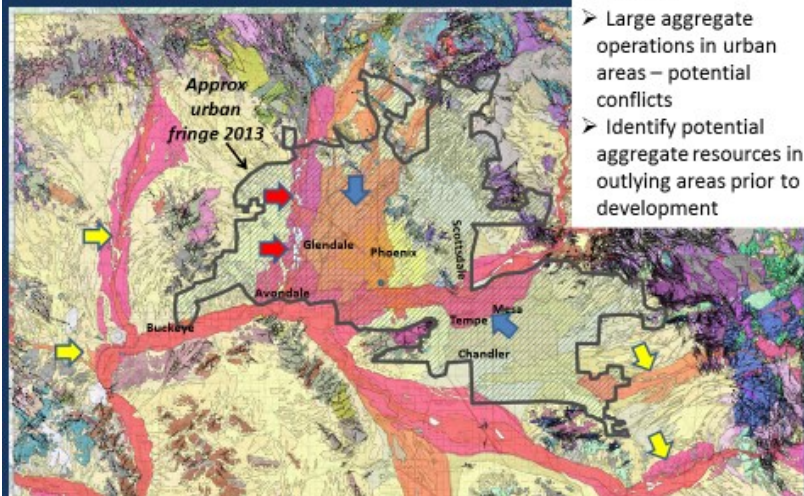
- Mineral resource identification, assessment, and characterization
- Digital repository of mining and mineral resource data, files, maps, and photos
- Energy resources (oil & gas, geothermal, coal, CO₂, helium, CO₂ sequestration)
- Geologic mapping
- Core and sample repositories

Arizona Geological Survey Mining Records Digitization

- 23 Special Collections:
 - ~13,500 folders
 - 836,553 pages of records
- 6 Photo Collections: ~7,400 images
- 1 Theses Collection: 371 papers
- 1 Map Collection: ~10,000 maps



Phoenix Metropolitan Area Geology and Urban Development



- Lots of area with potential aggregate resources no longer available
- Large aggregate operations in urban areas – potential conflicts
- Identify potential aggregate resources in outlying areas prior to development

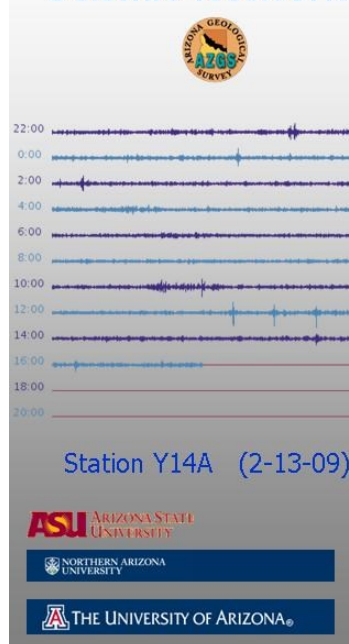
Environmental Geology - Key Duties

Identification, mitigation, and response to natural hazards (landslides, debris flows, post-wildfire floods, earth fissures, subsidence, expansive soils, earthquakes)

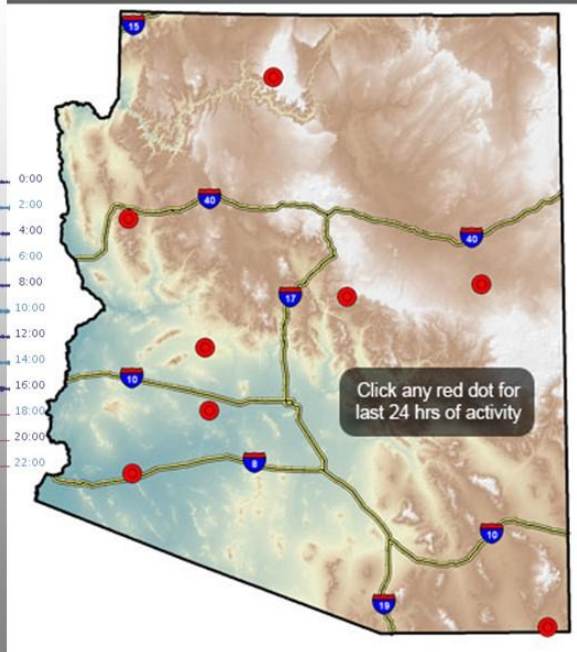
AZGS INTERACTIVE WEB MAP SERVICES



Arizona Integrated Seismic Network



Interactive Map! Seismic Stations in Arizona



Geoinformatics - Key Duties

- Maintain agency computers, servers, network, and software
- GIS internal support
- Develop and manage digital products and services
- Database development and maintenance
- Cyberinfrastructure research and development

U.S. National Geothermal Data System

NGDS

FREE online access to:

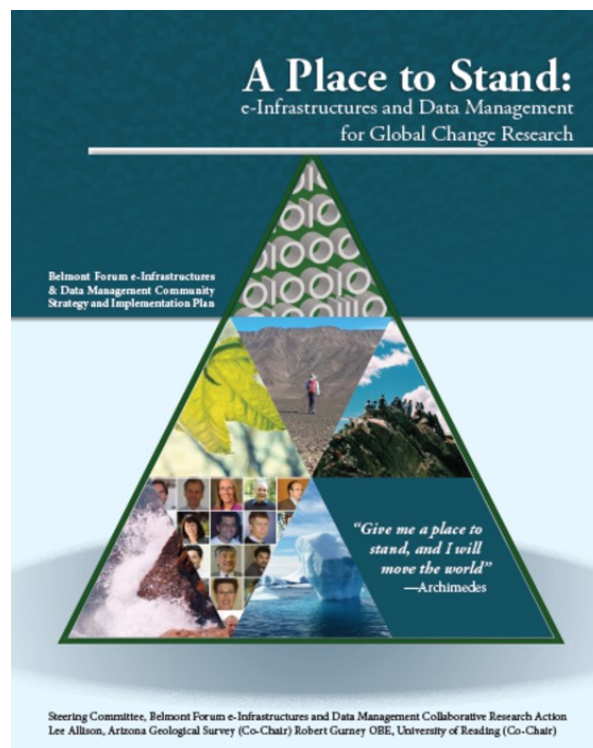
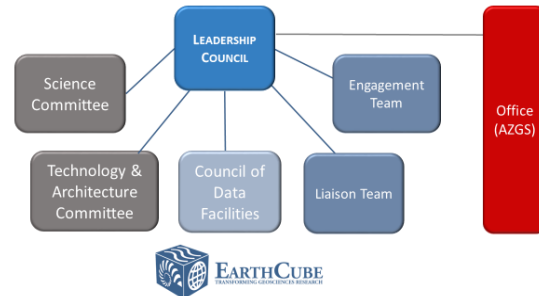
Maps, data, & documents from 65+ providers nationwide

- >10 million data records
- >3 million oil & gas wells
- >600,000 well logs
- >47,000 maps & reports

ENERGY Energy Efficiency & Renewable Energy

Powered by USGIN

EARTHCUBE DEMONSTRATION GOVERNANCE

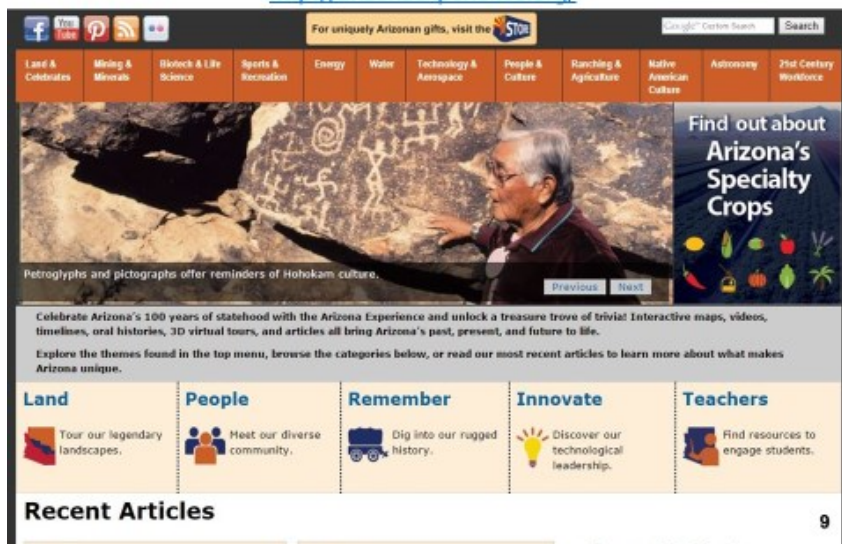


Geologic Extension Services - Key Duties

- Maintains 10 web sites
- *Arizona Experience* retail and online (Amazon) stores
- Public scientific and technical libraries in Tucson and Phoenix
- Publications – editing, production, distribution, and sales
- Handling public inquiries
- Education-outreach
- Press office

OUTREACH – THE AZ EXPERIENCE

<http://arizonaexperience.org/>



9

Facebook ~35,000 reached per week
3,500 engaged, 1,500 talking about

TWITTER: 2,800 Followers
(top 1% of feeds)

AZGS Assets

Grants and Contracts

The current grants in effect are summarized below in Table 4, including the amount of each award, funding agency, and start and end dates.

Since 2011, AZGS has successfully competed for more than \$35,807,848 in external research grants and contracts from federal, state, local, and private sponsors, compared to receiving \$5,364,100 in state appropriations during this period. AZGS has provided the State of Arizona with a \$6.68-to-\$1.00 direct return on its investment. We have received verbal confirmation of more than \$1.6 million in new projects starting in FY16 which will increase the ROI.

As a state geological survey, AZGS has long participated in the USGS STATEMAP program, obtaining federal funding through an annual competitive grant process, matched dollar for dollar with state funding. Each State Geologist determines the State's mapping priorities in consultation with a State Mapping Advisory Committee.

AZGS also is authorized to participate in the USGS National Geological and Geophysical Data Preservation Program (NGGDPP), which awards federal funding on an annual competitive basis to state geological organizations to digitize and archive critical geoscientific data, documents, and other reference material.

The following is a list of key external funding sources that support AZGS' programs and operations:

- American Association of Petroleum Geologists
- Arizona Department of Agriculture
- Arizona Department of Emergency Management
- Arizona Department of Water Resources
- Arizona State Land Department
- Arizona State Mine Inspector
- Federal Emergency Management Administration (FEMA)
- Freeport McMoRan Foundation
- Havasupai Tribe
- Helios Foundation
- McDowell Sonoran Conservancy
- Microsoft Foundation
- Mining Foundation of the Southwest
- National Renewable Energy Lab (NREL)
- National Science Foundation
- Salt River Project
- Sandia National Laboratory
- US Department of Energy
- US Energy Association
- US Forest Service
- US Geological Survey
- USGIN Foundation Inc.

In addition, two trust funds have made endowments to AZGS. The Troy Péwé Endowment (\$50,000) supports digitizing and archiving the extensive photographic and slide collection of the former ASU professor, and the Cathy S. Wellendorf Memorial Fund (\$11,000) supports AZGS' projects and activities related to environmental geology.

Table 4. Current Grants

Grant Title	Funding Agency	FY	Award Amount	Start Date	End Date
ORG0066 EarthCube Conceptual Design: Enterprise Architecture for Transformative Research and Collaboration Across the Geosciences Subaward	University of California, San Diego	13	\$57,240.00	09/15/2013	08/31/2016
ORG0065 EarthCube Building Blocks: Community Inventory of EarthCube Resources for Geoscience Interoperability (CINERGI) Subaward	University of California, San Diego	13	\$117,600.00	09/15/2013	08/31/2016
US4065 Earth Sciences: Instrumentation and Facilities (EAR/IF) - FY 2013	U.S. National Science Foundation	13	\$93,147.00	01/15/2014	12/31/2015
ORG0068 Post-Fire Debris Flow IGA	U.S. Department of Interior	13	\$40,000.00	06/15/2014	06/14/2016
ORG0160 Delivering an E-Infrastructure and Data Management Roadmap and Implementation Plan for the Belmont Forum	U.S. National Science Foundation	13	\$652,648.00	10/01/2013	03/31/2016
ORG0064 EarthCube Test Enterprise Governance: An Agile Approach Subaward	University of AZ	13	\$3,482,199.00	08/30/2013	02/29/2016
ORG0063 Collaborative Research: Geoinformatics: Development of Structural Geology and Tectonics Data System with Field and Lab Interface Subaward	University of Kansas	14	\$149,002.00	08/01/2014	07/31/2016
US2544 The State Component of the National Cooperative Geologic Mapping Program (STATEMAP) - FY 2014	USGS	14	\$171,331.00	09/01/2014	09/14/2015
ORG0062 Design, Testing and Validation of the National Geothermal Data System (NGDS) Contract	DOE/Sandia	14	\$420,000.00	05/01/2014	04/30/2016
ORG0159 National Geological & Geophysical Data Preservation Program	USGS	14	\$27,190.00	09/01/2014	09/01/2015
ORG0071 EarthCube Building Blocks Collaborative Proposal: Digital Crust: An Exploratory Environment for Earth Science Research and Learning Contract	University of California, San Diego	15	\$219,193.04	10/01/2014	08/31/2016
US2544 The State Component of the National Cooperative Geologic Mapping Program (STATEMAP) - FY 2015	USGS	15	\$170,931.00	09/12/2015	09/11/2016
ORG0069 Technical Support for the National Geothermal Data System Contract	USGIN/NREL	15	\$85,000.00	01/12/2015	12/31/2016
ORG0074 Subsurface	Salt River Project	15	\$99,734.00	04/08/2015	03/31/2016

Hydrogeologic Investigation of the Superstition Vistas Study Area Contract					
ORG0075 FEMA Pre-Disaster Mitigation Program	AZ Emergency Management & Military Affairs	15	\$150,656.52	12/31/2014	12/22/2016
ORG0618 State Mine Inspector ISA	AZ Mine Inspector	15	\$21,875.23	09/01/2012	10/30/2015
ORG0072 Online Earth Science Image Atlas and Story Maps to Support K-12 Earth Science Education in Arizona Contract	American Association of Petroleum Geologists Foundation	15	\$59,205.00	02/05/2015	02/01/2016
US6671 National Geological and Geophysical Data Preservation Program (NGGDPP) - FY 2015	USGS	15	\$43,361.00	09/01/2015	08/31/2016

Submitted and Pending Proposals

Grants that have been submitted and are currently pending approval are summarized below in Table 5, including the estimated amount of each award, funding agency, and projected length.

Table 5. Submitted and Pending Grants

Funding Source	Est. Award	Project Length
Freeport McMoRan Foundation	\$ 49,503	13 months
NSF- Collaborative Research	\$ 387,373	3 years
NSF-Geoinformatics	\$ 155,000	2 years
DoD *	\$ 223,999	3 years
USDA-SBIR	\$ 27,934	8 months
NSF- GEO International *	\$1,395,736	3 years
USGS-NCGMP	\$ 299,517	1 year
Joint Fire Science Program (JFSP)	\$ 90,721	3 years
FEMA- Coconino County	\$ 38,000	1 year
NSF (UA)	\$ 30,000	3 years
Total	\$2,697,783	

* Denotes verbal approval of funding

Grant Proposals in Preparation

Grants that are currently under development are summarized below in Table 6, including the estimated amount of each award, funding agency, and projected length.

Table 6. Grant Proposals in Development

Funding Source	Est. Award	Project Length
USGS- NCGDPP	\$ 50,000	1 year
DOE - Mineral Recovery Phase	\$ 400,000	2 years

2		
NSF - Western Big Data Hub Spoke	\$1,000,000	3 years
AZ State Land Department-McMullen Valley	\$ 53,594	6 months
NSF- EC Capabilities and Prototypes	TBD	3 years

Physical Assets

The AZGS owns and maintains comprehensive and diverse geoscience libraries and sample and core repositories. AZGS maintains libraries in both its offices in Tucson and Phoenix, and also operates the Arizona Experience Store in Tucson along with an online Amazon storefront. Highlights of AZGS' physical assets include the following:

Arizona Broadband Seismic Network

Eight state-of the art seismic monitoring stations state capable of detecting earthquakes of 3.0 magnitude and higher anywhere in the state; acquired from the EarthScope USArray network in 2009.

Information Technology Equipment

AZGS is well-equipped with an array of IT equipment, including computers, printers, map plotters, scanners, and other equipment. Of particular significance is the spectrum of AZGS server system, having a total of more than 260 terabyte capacity, supporting the Survey's networks, email system, data repositories, websites and data viewers, and network backups. AZGS both manages and is a regional node on the National Geothermal Data System, supporting 65+ distributed data providers nationwide. The system provides replication backup on a near-real time basis, and uses extensive cloud computing resources.

Publications and Maps

AZGS is a publishing house, with wholesale, retail, and online distribution of products. More than 1,000 AZGS publications are now online for free downloading. Most publications are now print on demand. Popular print publications and maps are sold in state and national parks and other outlets across the region.

Reference Materials

- AZGS library—Comprehensive collection (digital and hardcopy) of research papers, reports, maps, and periodicals. The Tucson location library holds more than 1,500 linear feet of material (over 15,000 volumes) and the Phoenix office has more than 900 linear feet.
- AZGS map archive
 - More than 3,500 topographic maps, including three copies of Arizona topographic maps (1:24,000; 1:48,000, 1:62,500, 1:100,000, 1:250,000)
 - Several hundred archived maps; work products of AZGS geologists
 - Thousands of aerial photographs
- Mining Data Files (Phoenix office)
 - More than 550 linear feet of mine file special collections, including approximately 800,000 pages, 10,000 maps, and 7,500 photos
- U.S. Bureau of Mines Collection
- U.S. Geological Survey Collection

- Berry Collection—~ 38 linear feet of geothermal data from the Western U.S.; appraised value of \$250,000
- Nations Collection—Includes unpublished data and ~ 800 photographic slides
- Large-format geologic maps—more than 1,000 maps
- Historic mine files and clippings—more than 87 linear feet

Core Repository

A core repository that includes approximately 28,000 feet of rock core from wells drilled in Arizona; highlights:

- Patagonia core
 - ~10,500 linear feet in 1,050 boxes (stored at Freeport-McMoRan)
- Ridgeway AZ Oil Corporation core
 - ~ 2,000 linear feet in 212 boxes
- TG-AZ Company core
 - ~ 700 linear feet (stored at Freeport-McMoRan)
- Additional core stored at AZGS
 - ~ 14,000 linear feet in 1,402 boxes
- HydroSystems Well Log Cuttings
 - ~ rock chips and logs from ~180 wells in central and northern Arizona

Well Cuttings Repository

Chip samples from >1,000 oil, gas, geothermal, helium, and carbon dioxide wells drilled in Arizona. Maintained on behalf of the Oil & Gas Conservation Commission.

Other Collections

- Mineral collection of the ores of SE Arizona
- Historic copper topographic plates—52 sets, with each set comprised of 3 individual plates; USGS estimated value of collection is approximately \$31,000.

Office and Field Equipment

- Field equipment, including GPS devices, field gear, and more.
- Exhibit booth equipment and supplies, including displays, monitors, etc.

Vehicle Fleet

- 4 – Jeep Grand Cherokees (2011)
- 2 – Dodge Ram trucks (2001)
- 1 - Chevrolet Impala (2007)

Digital Assets

AZGS Managed Websites

- | | |
|--|---|
| • AZGS website | http://www.azgs.az.gov |
| • Arizona Experience | http://arizonaexperience.org |
| • Belmont Forum e-Infrastructure & Data Management Knowledge Hub | http://www.bfe-inf.org |
| • EarthCube | http://earthcube.org |
| • National Geothermal Data System (NGDS) | http://www.geothermaldata.org |
| • Geoscience Information Network (USGIN) | http://usgin.org |
| • Arizona Oil & Gas Conservation Commission | http://www.azogcc.az.gov |

AZGS Online Map Services

- Geologic Map of Arizona <http://data.azgs.az.gov/geologic-map-of-arizona>
 - Statewide geologic map; may be viewed using a web browser, or via Google Earth or ESRI's ArcGIS explorer
- AZGS Mining Data Repository <http://minedata.azgs.az.gov>
 - Hosts 1000s of historic Arizona mine files, photographs, and maps from the collection of the former AZ Department of Mines and Mineral Resources.
- Mines of Arizona http://www.azgs.az.gov/google_docs/Arizona-mrds-fUS04-39.kmz
 - Locations, status, primary and secondary commodities. Courtesy of the US Geological Survey's Mineral Resources database. Link opens a Google Earth (.kmz) file.
- Natural Hazards in Arizona Viewer <http://data.azgs.az.gov/hazard-viewer>
 - Showcases earth fissures, active faults and earthquakes, flood potential and fire risk index. Includes "Find local hazards" tool
- Seismic Stations in Arizona http://www.azgs.az.gov/eq_monitor.shtml
 - Explore Arizona earthquake activity in near real-time using the Arizona Broadband Seismic Network
- Earth Fissure Viewer <http://maps.azgs.az.gov/earth-fissure-viewer>
 - Shows the distribution of mapped earth fissures in Cochise, Maricopa and Pinal Counties. Also, provides links to 24 published earth fissure study area maps
- Arizona Oil & Gas Well Viewer <http://welldata.azogcc.az.gov>
 - Displays 1,100 wells, including wells drilled for oil & gas and geothermal exploration. Digital well logs and, in some cases, log ASCII standard (LAS) digital data accompany each well
- Holbrook Basin Potash Deposit <http://services.azgs.az.gov/OnlineMaps/holbrookPotash>
 - Shows drilled and permitted drill holes and includes an isopach map showing potash thickness
- Interactive Geologic Map of Grand Canyon, AZ <http://rclark.github.io/grand-canyon-geology>
 - Displays the geology of Grand Canyon. Mapping largely by George Billingsley and his colleagues at the U.S. Geological Survey.

AZGS Online Database Services

- AZGS Document Repository <http://repository.azgs.az.gov>
 - 95% of all materials—including bulletins, circulars, digital geologic maps, contributed maps, reports, and open-file reports published by AZGS from 1915 to the present.
- U.S. Geoscience Information Network (USGIN) <http://usgin.org>

- USGIN exposes, connects, and opens earth science data. USGIN is a federated information-sharing framework that uses free and open-source technology, capable of interacting with similarly configured data-sharing networks.
- National Geothermal Data System (NGDS) <http://geothermaldata.org>
 - NGDS is a distributed data system providing access to information resources related to geothermal energy. Data contributors include academic researchers, private industry, and state and federal agencies.
- Arizona Geological Survey Mining Data <http://minedata.azgs.az.gov>
 - Hosts 10,000s of Arizona mine files, photographs, and maps from the collection of the former AZ Department of Mines and Mineral Resources; contains 19 special collections.
- AZGeoBib <http://www.azgs.az.gov/azgeobibweb>
 - Online Bibliography of Arizona Geology (AZGeoBib); more than 13,000 citations of geologic studies from throughout Arizona. The citation record goes back to A.D. 1848

AZGS Geologic Story Maps

- Geologist in Grand Canyon <http://bit.ly/KbVDOe>
 - Join an AZGS geologist and a team of Conoco geoscientists as they raft through Grand Canyon examining the Precambrian Chuar Group. The trip, which occurred in 1996, begins at Lees Ferry and ends at river-mile 225.
- Arizona's San Pedro River <http://uagis.maps.arcgis.com/apps/MapTour/?appid=f6a2b2630c3b4b3bb2f159d40a53d131>
 - The San Pedro River is Arizona's last undammed river. This 122-mile map story from the US-Mexico Frontier to Winkelman, Arizona, shows the San Pedro River Valley as seen through the eyes of AZGS geologist, Joe Cook.
- Geologic Tour of GC's South Kaibab Trail <http://tinyurl.com/geologic-tour-grand-canyon>
 - Join Dr. Dale Nations, Emeritus Regents Professor at Northern Arizona University, and his students as they descend from the South Rim along the South Kaibab Trail to Phantom Ranch on the Canyon floor.

Outreach and Social Media

- Arizona Geology Blog <http://arizonageology.blogspot.com>
 - >4,200 blog posts published since 2007, >2 million page views; archived by the Library of Congress
- Arizona Mining Review online video magazine <https://www.youtube.com/playlist?list=PLLkn9l>

- Monthly video broadcast covering recent news and related developments within the AZ mining industry; 36 monthly episodes beginning in January 2013 [zbK_rcCj38_m1nlt7MweBLuiNTb](http://www.youtube.com/watch?v=zbK_rcCj38_m1nlt7MweBLuiNTb)
- AZGS YouTube channel <https://www.youtube.com/user/StateGeologists>
 - 125 videos posted since 2009
 - Earthquake video views approaching 15,000
- Twitter <http://bit.ly/1OJ7G0x>
 - @AZGeology; More than 3,500 followers
- Facebook <https://www.facebook.com/AZ.Geological.Survey>
 - Reaches approximately 15,000-85,000 people a week, with more than 900 actively engaged; >5,000 'likes'

Attachment 1. AZGS: A Short History

The Arizona Geological Survey (AZGS) is the latest in a line of academic departments and state agencies serving the people of the Arizona Territory and now the State of Arizona. In 1883, then Territorial Governor Tritle, requested federal assistance in establishing a geologic survey for the Arizona Territory. The U.S. Congress responded in 1888 by creating the post of Territorial Geologist of Arizona. The unpaid position of Territorial Geologist first went to John F. Blandy, who served until the mid-1890s.

Upon gaining statehood in 1912, the position of Territorial Geologist was abolished. Table 1 comprises, in chronological order from most recent to earliest, the territorial and state geologic agencies. From 1893 until 1915, the role of geologic mapping and reporting was handed off to the University of Arizona Bureau of Mines. In 1915, the Arizona Bureau of Mines was established at the University of Arizona with Charles Willis as its first director. See our [online yearbook](#) for Arizona's former directors of state and territorial geologic agencies.

Table 1. Territorial and state geologic agencies of Arizona from 1888-2007

1988–Present	Arizona Geological Survey
1977–1988	University of Arizona Arizona Bureau of Geology & Mineral Technology
1915–1977	University of Arizona Arizona Bureau of Mines
1893–1915	University of Arizona Bureau of Mines
1888–1890 1898–1912	Office of the Territorial Geologist



The First Fieldnotes

In 1971, the first volume of “Fieldnotes,” a non-technical geologic newsletter was published; its successor, “[Arizona Geology](#),” first issued in the Fall of 1988 and is still published quarterly. That same year Dr. William H. Dresher was named Director, and for the first time, “State Geologist.” In 1977, the Bureau became the Bureau of Geology and Mineral Technology, comprising the geological survey and a mineral technology branch. The geologic survey branch became responsible for assessing and informing the public about [geologic hazards](#) in Arizona.

The AZGS was established as an independent state agency on July 1, 1988, and it still maintain strong collegial ties with faculty and staff at the University of Arizona. In 1991, the AZGS became the institutional home of [Arizona’s Oil & Gas Conservation Commission](#)—a five-member commission charged with supporting and regulating oil and gas exploration and development in the state. The US Geological Survey in conjunction with the AZGS moved to its present [location](#) at 416 W. Congress St., Tucson in July 1995. In 2011, AZGS took custody of the assets of Arizona Department of Mines & Mineral Resources, when it went bankrupt. At the request of Gov. Jan Brewer, the Legislature formally merged ADMMR into the Survey.

Attachment 2. Arizona Revised Statutes: Arizona Geological Survey

27-102. Arizona geological survey; state geologist; powers

A. The Arizona geological survey is established with offices located in proximity to the University of Arizona in Tucson. The governor shall appoint a state geologist, pursuant to section 38-211, to be the administrative head of the Arizona geological survey and to serve at the pleasure of the governor. The state geologist shall be registered as a geologist by the state board of technical registration, a graduate of an accredited institution and otherwise qualified by education and experience to direct the research and information functions of the Arizona geological survey.

B. The state geologist may organize the Arizona geological survey into such administrative units, and, subject to title 41, chapter 4, article 4, employ professional and support staff, as necessary to achieve the objectives and promote the policies prescribed by this article.

C. The state geologist may:

1. Retain the services of faculty members or students, and shall have reasonable access to the data and other resources, of the University of Arizona or any other state university in this state to conduct or supervise research, experimentation or other related work of the Arizona geological survey.

2. Organize field expeditions to perform work for the Arizona geological survey using university students who are sufficiently advanced in their study of geology to be able to perform satisfactory work.

3. Establish and appoint an advisory board consisting of independent practicing geologists, university or college faculty, mining geologists and others who use and rely on data, information and other services of the Arizona geological survey.

4. Employ volunteer staff as necessary.

D. The expenses of the Arizona geological survey shall be paid by annual appropriation from the state general fund and as otherwise provided by this article.

27-103. Objectives of Arizona geological survey

The objectives of the Arizona geological survey are to:

1. Serve as a primary source of geologic information in this state to enhance public understanding of the state's geologic character, geologic hazards and limitations and mining and mineral resources.
2. Inform, advise and assist the public in matters concerning the geological processes, materials and landscapes and the development and use of the mineral resources of this state.
3. Encourage the wise use of the lands and mineral resources of this state toward its development.
4. Provide technical advice and assistance in geology to other state and local governmental agencies engaged in projects in which the geologic setting, character or mineral resources of the state are involved.
5. Provide technical advice and assistance in geology to industry toward the wise development and use of the mineral and land resources of this state.

27-104. Qualifications of employees; private activities relating to geological services prohibited
Qualifications of employees of the Arizona geological survey shall be prescribed by the state geologist with the concurrence of the governor. Neither the state geologist nor any employee shall:

1. Acquire a pecuniary interest in any mineral resources property in the state.
2. Act as broker or agent for any purchaser, owner or agent of mineral resources property, equipment or products.
3. Accept any commission or compensation for services rendered in connection with industry in this state.
4. Make an investigation or report on an individual Arizona deposit of mineral resources or metallurgical process other than pursuant to such employee's official duties.

27-105. Immunity

Any claim or action against the Arizona geological survey, the state geologist or any other officer, employee or volunteer of the geological survey in the person's official capacity must be brought against the state of Arizona and not against the geological survey, state geologist or officer, employee or volunteer individually.

27-106. Duties of Arizona geological survey

The Arizona geological survey shall:

1. Map and describe the bedrock and related geologic materials and processes in Arizona, as follows:
 - (a) Prepare geologic maps that show the distribution of rock formations and surficial materials at the surface and in the subsurface.
 - (b) Describe the character of rock and surficial materials, including their age, origin and physical and chemical properties.
 - (c) Map, describe and monitor known and potential geologic hazards and limitations to land and resource management.
 - (d) Map and characterize energy and mineral resources and identify areas that may have potential for future discoveries.
2. Provide objective, scientific information about the geologic character of this state as follows:
 - (a) Provide timely, courteous responses to requests for information, advice and assistance from the public.
 - (b) Maintain a computerized bibliographic database of maps and reports on the geology of this state that is accessible to the public.
 - (c) Maintain an internet web site that includes information about the Arizona geological survey, products and services available and the geologic character of this state.
 - (d) Give lectures and talks, conduct workshops, lead field trips and provide information and assistance to public, educational and professional groups.

(e) Publish reports and other information, written in nontechnical terms, to inform those not trained in geology about the geologic character of Arizona.

3. Prepare all data files of known areas of earth fissures, produce maps of those areas with overlays showing affected counties, cities, towns, highways and streets and transmit the maps in printed and electronic format to the state real estate department for purposes of providing public access to the earth fissure maps pursuant to this paragraph and section 32 2117. The Arizona geological survey shall provide any map to any member of the public in printed or electronic format on request. The following notice shall be displayed below each map:

Notice

The state of Arizona has made a reasonable effort to ensure the accuracy of this map when it was produced, but errors may be present and the state of Arizona does not guarantee its accuracy. The map supplements, and is not a substitute for, a professional inspection of property for defects and conditions.

4. Operate and maintain a central repository and a computerized database for reports, books, maps and other publications regarding the geology, mining and mineral resources and associated technologies. Such repository and database shall be available for the use of the public and may be located at or connected with the university of Arizona or another state university or agency of this state. All databases and other archival materials shall be maintained in a secure and retrievable format and at a location prescribed by the state geologist to protect and preserve information from damage or destruction.

5. Operate and maintain a central repository for rock cores, well cuttings and samples and all associated supplemental data consistent with the laws of this state requiring the deposit of such material and information. Such repository shall be available for the use of the public.

6. Receive and expend any monies arising from grants, contracts, contributions, gratuities or reimbursements payable or distributable to this state from the United States, or from state, county, municipal or other governmental sources. The Arizona geological survey shall also receive and expend any monies arising from grants, contracts, contributions, gratuities or reimbursements donated by private persons or corporations. Monies received pursuant to this paragraph shall be deposited in the geological survey fund and handled pursuant to section 27 107.

7. Contract and be contracted with.

8. Utilize the services and expertise of the universities of the state at the discretion of the state geologist.

9. Cooperate with local, county, state and federal agencies.

10. Provide administrative and staff support for the Arizona oil and gas conservation commission.

11. Provide quality mining data, evaluation and assistance relating to mining and mineral development to the legislature, federal, state and local governmental agencies and the public.

12. Serve as a source of mining information and data necessary or advisable to attain its objectives. The state geologist may establish reasonable fees for publications.

13. Cooperate with the Arizona corporation commission in its investigations and administration of laws, relating to the sale of mining securities.

27-107. Powers and duties of state geologist; fund

A. The state geologist shall:

1. Establish such administrative functions and offices as necessary to achieve the purposes of this article.

2. Prescribe the number and professional disciplines of the technical staff and their office and laboratory associates.

3. Direct the work of the Arizona geological survey and the formulation of its program and policies.

4. Adopt such rules as are necessary to carry out the purposes of this article.

5. Purchase or lease necessary office and laboratory equipment and acquire facilities from the

state or lease necessary office and laboratory space.

6. Apply for and accept gifts, bequests or legacies of real or personal property or any other contribution, financial or otherwise, for use pursuant to the direction of the donor or, in the absence of an express direction, to be disposed of for the best interests of this state. The state geologist shall honor any restriction imposed by the donor on divulging contributed information or tangible personal property.

7. Accept from the federal, state and local governments or their agencies monies made available to this state for the purposes of this article.

8. Enter into cooperative agreements with federal, county or municipal governments or their agencies or with any agency or governmental unit established by the law of this or any other state for the purpose of carrying out the provisions of this article.

9. Contract with persons and organizations, public or private, to provide services for the Arizona geological survey.

10. Appoint a person with a background in oil and gas conservation to act on behalf of the oil and gas conservation commission and administer and enforce the applicable provisions of chapter 4 of this title relating to the oil and gas conservation commission.

B. The state geologist or the geologist's designee, at any time, may enter the property and inspect wells drilled for oil, gas, geothermal resources, helium or carbon dioxide and shall control property, machinery and appliances necessary to gauge the wells.

C. A geological survey fund is established for the purposes provided in this article consisting of appropriations and all monies received pursuant to this article and section 27 515. Monies shall be separately accounted for and used as a continuing appropriation by the state geologist for the purposes provided from each source. Monies in the fund are exempt from the provisions of section 35 190 relating to lapsing of appropriations.

27-108. Publications; deposit

A. The state geologist may publish, in the form of bulletins, circulars, maps and other related series, or otherwise make available to state agencies, government officials, industry and the public the results of geological and related research and investigation undertaken by the Arizona geological survey. A publication shall not include any confidential information pursuant to section 27 522. The state geologist shall consult with the operator and obtain the approval of the scope of work for the publication before the state geologist releases any proposed publication pertaining to a project regulated by the oil and gas conservation commission.

B. The publications of the Arizona geological survey shall be printed as the state geologist determines and distributed or sold as the interests of this state or science demand. Money obtained by the sale of publications shall be deposited in the geological survey fund established by section 27 107 for printing further publications.

C. All materials collected, after having served the purpose of the Arizona geological survey, shall be made available to the universities, community colleges and high schools of this state.

27-109. Annual report of state geologist

The state geologist shall make an annual report to the governor on the progress and condition of the Arizona geological survey, of pertinent facts concerning this state's geologic setting and of such other pertinent information as the state geologist deems proper.

32-2117. Earth fissure maps; posting; immunity

A. On receipt of maps from the Arizona geological survey, the state real estate department shall provide any earth fissure map to any member of the public in printed or electronic format on request and provide access on its website to the earth fissure maps prepared by the Arizona geological survey pursuant to section 27 106, paragraph 3. The following notice shall be displayed below each map:

Notice

The state of Arizona has made a reasonable effort to ensure the accuracy of this map when it

was produced, but errors may be present and the state of Arizona does not guarantee its accuracy. The map supplements, and is not a substitute for, a professional inspection of property for defects and conditions.

B. Nothing in this section shall be construed as denying a person rights guaranteed by the Arizona Constitution, and notwithstanding any other law, a subdivider, owner or licensee is not liable to any person or governmental entity for any act or failure to act in connection with:

1. The disclosure of real estate subject to earth fissures if the subdivider, owner or licensee provides a written disclosure or includes notice in a public report, issued pursuant to section 32 2183 or 32 2195.03, with respect to real estate subject to earth fissures, of the map and website described in subsection A of this section. The written disclosure or notice in a public report, issued pursuant to section 32 2183 or 32 2195.03, of the map and website does not create an independent cause of action.

2. Any disclosure that occurred before the date the map described in subsection A of this section is posted on the website if the subdivider, owner or licensee had no actual knowledge that the land was subject to earth fissures before the map was posted.

41-3022.07. Arizona geological survey; termination July 1, 2022

A. The Arizona geological survey terminates on July 1, 2022.

B. Title 27, chapter 1, articles 1 and 4 are repealed on January 1, 2023.